



Forest Health Protection

Pacific Southwest Region



Date: August 23, 2011
File Code: 3420

To: Sharon Heywood, Forest Supervisor, Shasta-Trinity National Forest
Subject: Comments On Mayflower/Pilgrim Project (FHP Report N11-13)

Shasta-Trinity National Forest Supervisor Sharon Heywood has asked me to comment on the goals and objectives of the Mayflower/Pilgrim project on the McCloud Flats. Although I have not been recently involved with the project, Dave Schultz (former Northern California Shared Service Area Entomologist) and I were involved with some of the early assessments and recommendations during the development of the project. In Forest Health Protection Report N06-05 (2006), Dave offered general and specific recommendations for the treatment of the overall project area, as well as several specific project Units. These recommendations were based on the best available science and over 25 years of personal observations of insect and disease behavior at Mc Cloud Flats.

One of the major objectives of the Mayflower/Pilgrim project is to improve the health and resiliency of the ponderosa pine stands in the area. Through the years, these stands have been impacted by two root diseases, *Heterobasidion* root disease (formerly known as *annosum* root disease) and black stain root disease. Trees weakened by these root diseases are susceptible to attack by bark beetles, particularly during periods of drought. During these periods, populations of western pine beetle, mountain pine beetle and red turpentine beetle build up and cause extensive ponderosa pine mortality in the vicinity of root disease centers. Mortality commonly continues for a year or two after precipitation returns to normal. This scenario was repeated on McCloud Flats after the 1975-77 drought, the 1987-91 drought, and most recently, during the 2001-2005 drought. Treatments to reduce the impacts of root disease reduce the impacts of bark beetles as well.

Black stain root disease has been present in the ponderosa pine on McCloud Flats since at least the 1960s. Black stain root disease has not always been recognized, and a lot of time and effort has been spent chasing the bark beetles that subsequently affect root diseased trees. Due to repeated entries to implement salvage and sanitation, a lot of stumps were created on the Flats. Stumps are the main entry court for infection of pines by spores of *Heterobasidion irregularare* (formerly known as "the P-type strain of *H. annosum*"). Infection can be prevented by treating stumps with a registered borate pesticide (Sproax or Cellu-Treat). However, because the use of borate stump treatments did not become routine until the latest revision of the Forest Plan, numerous *Heterobasidion* root disease pockets became established on the Flats. Both black stain and *Heterobasidion* root disease may be present in the same stand.

A wide variety of treatments involving various levels of cutting and burning have been installed on the Flats over the past several decades. While these were operational treatments and not experiments, some conclusions can still be drawn from the effects demonstrated on black stain and *Heterobasidion* root diseases.

Leptographium wageneri var. *wageneri* (the pine strain of the fungus that causes black stain root disease) infects only ponderosa and Jeffrey pines. The fungus survives best in cool, moist, shady stands. The black stain fungus survives only in living pine trees and will die within 3-5 years after the host dies. A highly effective treatment to control the disease is to remove all trees and replant, allowing the pathogen to die out on the site. Because white fir, Douglas-fir, incense-cedar and hardwoods are not hosts, those species can be left if they don't interfere with the slash disposal, site preparation and planting. A less effective treatment is to leave a few scattered overstory pines as a source of wildlife snags. In units where approximately 12 of the best looking overstory pines per acre have been left, about half of those trees have died over the past 25 years. Opening the stand enough to increase the soil temperature has slowed, but not stopped, the progression of the disease. Retention of a scattered overstory has suppressed the growth of the planted and natural trees in the understory. In spite of being a very high site quality, the understory trees are only putting on about 6 inches of height growth per year.

H. irregularare infects pines, incense-cedar and juniper. This disease seems to flourish under hot and dry conditions. As mentioned above, the most common means of infection is through freshly cut stumps. *H. irregularare* will kill the host trees and can also survive as a saprophyte in stumps and the remaining root mass of standing dead trees as long as there is any sound wood, up to 35-50 years. On McCloud Flats, we find viable fungal fruiting bodies in stumps that were cut 10-15-years previously. On the Flats, most stumps appear to be too deteriorated to establish new *Heterobasidion* root disease centers by 20-25 years after cutting. As long as roots from living host trees can contact an infected root mass, the root disease center will persist. Some individual *Heterobasidion* root disease centers on the Flats have enlarged to approximately 5 acres in size and show no signs of dying out. Thinning a *Heterobasidion* root disease center does not stop infected trees from dying, and infected trees will die more quickly if they are exposed to an additional stress such as drought or scorch from fire.

A treatment which has had some success in regenerating stands with *Heterobasidion* root disease centers on the Flats is to clear cut and re-plant. Because it usually takes about 15 years before the seedlings get large enough for their roots to contact the old stumps, many of the stumps no longer contain viable *Heterobasidion* inoculum. There are usually a few holes that develop in these plantations because variations in the rate of seedling root growth and stump deterioration allow some new infections to happen. The use of a registered borate compound on the larger stumps in areas to be regenerated is useful to keep the number of infected stumps to a minimum. Retaining overstory host trees (pine, cedar, juniper) in *Heterobasidion* root disease centers being regenerated increases the risk of maintaining an active root disease center.

In summary: for both *Heterobasidion* and black stain root disease centers, the more the regeneration unit resembles a single-layer plantation of seedlings and saplings (without retaining an infested overstory), the greater the probability is of establishing a healthy replacement stand. With black stain root disease, it is possible to retain a scattered overstory of 4-6 trees per acre, although there will be a tradeoff of reduced growth of the

replacement stand. With *Heterobasidion* root disease, retaining overstory host trees decreases the probability of establishing a replacement stand that has a high degree of crown cover. For this reason, in many of the Units of the Mayflower/Pilgrim project, the removal of most or all of the overstory pines is necessary in order to break the infection cycle of the two root diseases, allowing for the development of stands that are more resilient and resistant to insects and diseases.

/s/ Pete Angwin

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